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Abstracts

Organogenesis

361

Differential expression and alternative splicing of *SoWUSCHEL* is associated with sexual dimorphism in Spinacia oleracea

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The Arabidopsis *WUSCHEL* (WUS) gene is a key element of establishing niches of stem cells in both vegetative and reproductive meristems, and is involved in both early and late floral development. During development of the fourth whorl, the *WUSCHEL/AGAMOUS* negative feedback loop ensures initiation of *AGAMOUS* expression while creating a determinate flower. In dioecious spinach, flowers develop as either male or female and are unisexual from inception. Male flowers terminate in a ring of four stamens and have no fourth whorl. Females never develop a third whorl and terminate in a single carpel. Because *WUSCHEL's* role in flower development is concentrated in fourth whorl, we sought to characterize the role of the spinach homolog of *WUSCHEL* in the regulation of sexual dimorphism. We found differences in spatial expression patterns between male and female flowers, with females following the pattern as in Arabidopsis. Male flowers exhibited broad spatial expression in all stages of stamen development, as well as a dramatic increase in transcript levels versus female flowers. We retrieved an alternatively spliced transcript present only in male floral tissue. The transcript has an intact DNA binding domain, but has an altered and shortened amino acid sequence in its activation domain, which is encoded in the third exon. These results point to a model in which vast upregulation of a dominant negative alternative version of WUSCHEL in male flowers results in the simultaneous loss of *AGAMOUS* expression and meristemic identity in the center of the flower leading to the absence of the fourth whorl.

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362

Abdominal muscle development in marine shrimp

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Penaeoidean shrimp develop rapidly from a freely-spawned egg to the first larval stage, the nauplius, which has three pairs of swimming limbs (first and second antennae and mandibles). The naupliar appendages are also used for swimming at the subsequent protozoeal stage. At the next larval stage, the mysis, thoracic limbs (periopods) take over the locomotory function, and finally, in the postlarva, five pairs of abdominal limbs (pleopods) are used for swimming as in the adult. In addition, the tail is used for rapid backward movement. Since the cellular and molecular basis of muscle development is unknown in shrimp, we performed a descriptive ontogenetic study of muscle anatomy in larval shrimp, focusing on the abdominal muscles. Rhodamine-phalloidin was used to stain the microfilaments in muscles of larval Pacific white shrimp *Litopenaeus vannamei*, which were then analyzed by confocal microscopy. Muscles were identified by comparison with adult *Litopenaeus setiferus* (Young, 1959), working backward through the ontogenetic sequence nauplius > protozoea > mysis > postlarva. The adult body plan and muscle groups were present at the postlarva I. Abdominal limb muscles developed during the mysis stage, along with the formation of the pleopods. Abdominal trunk muscle groups formed during the protozoeal and mysis stages. The adult uropod (6th abdominal limb) and telson (last body segment) muscles were not present in the protozoea but had formed by mysis I. The results provide additional comparative data for arthropod muscle anatomy. A better understanding of muscle development may also be useful for shrimp aquaculture.

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363

Neurotrophin 3 in the esophageal smooth-to-skeletal muscle transdifferentiation and muscarinic-to-nicotinic acetylcholine receptor transition

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We reported that both the esophageal smooth-to-skeletal muscle transdifferentiation and the muscarinic-to-nicotinic acetylcholine (AChE) receptor type transition depended on Myf5 and MyoD myogenic regulatory factors (MRFs). Importantly, neurotrophin 3 (NT3) was absent in Myf5−/−: MyoD−/− (or amyogenic) term embryo esophagi, while development of the esophageal vagal and enteric innervation

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